

COMET 12P/PONS-BROOKS. SECOND OUTBURST?

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Following our first report of the coma expansion rate after the outburst occurred on comet 12P/Pons-Brooks last July 19, 2023 (ATel #16194), a deeper analysis of the same images revealed a second, much brighter wavefront in the inner coma of the comet, clearly visible in the animation available at the link below.

We measured the diameter of this inner coma on seven CCD images, publicly available, taken between July 22 and July 31, 2023, by the 2-m Faulkes North Telescope at the LCO-Haleakala Observatory (Maui, Hawaii, USA), as done previously for the first, larger coma, but applying a different procedure. The images were first processed with a Larson-Sekanina radial shift of 10 pixels, followed by a Larson-Sekanina rotational gradient of 20°, to enhance curvilinear and radial morphological details. Then we applied a polar transformation from the X, Y format into a ρ , θ format, centered at the optocenter of the comet, assumed as the position of the nucleus. Photometric profiles were sampled radially from the optocenter at a fixed PA of 150°, to measure the exact distance in pixels of the peak intensity of the outer edge of the coma, then the measurements were plotted after conversion into km (Fig. 1).

The linear regression analysis (Fig. 2) showed a much slower expansion rate of the coma vs the first outburst, at 86 ± 18 m/s, suggesting either the presence of larger ice-dust particles with lower speed and greater light scattering properties, or the occurrence of a second outburst, probably more collimated and directed towards the Earths.

Calculation of the intercept of the regression line of Fig. 2 with the x axis supports the second hypothesis, since the start of the expansion of this coma (i.e., the beginning of a second outburst) was estimated to have occurred about 30 h after the first outburst of July 19, on JD 2460146.33 \pm 0.5 (July 20.83, 2023 \pm 0.5d).

We are grateful to the LCO-Haleakala Observatory for making the images of comet 12P publicly available, thus making this study possible.

Figures and extra material at
https://web.oapd.inaf.it/bedin/files/PAPERS_eMATERIALS/ATel/12P